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A sediment budget of a sandur in the forefield of the Pasterze glacier (Upper Tauern, Austria)

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Sediment budgets provide a useful mean to quantify sediment transfers and storages within a landscape. The aims of this study are to establish a sediment budget of a partially closed system in the forefield of the Pasterze glacier and to compare different geophysical techniques for sediment budget investigations. The study site is a former lake that has been completely filled up by continuous fluvioglacial sedimentation. The sandur has currently a size of about 12 ha and is exposed by the withdrawal of the Pasterze glacier since the 1960s. To avoid high sediment input rates to the Margaritze water reservoir the sandur outlet was dammed artificially which consequently caused high sedimentation rates.

During the ablation period of 2006 discharge, suspended load, and the concentration of solutes was measured. Avalanche and rock fall deposits were mapped and estimated gravimetrically. A geomorphological map was designed to identify the major paths of the sediment transfer processes in the study area. Additionally thickness of the deposited sediments was measured applying ground penetrating radar, DC-resistivity soundings and radiomagnetotellurics. Results show that the meltwater stream from the Pasterze glacier is the dominant path of sediment through the sandur system.

First findings from geophysical applications indicate sediment thickness for the sandur of 8 to 15m with an undulated structure of the sediment-bedrock boundary. In 2006 more than 50.000t of suspended load, produced by glacial erosion, were conveyed through the system. Suspended sediment concentrations varied between 0.1 and 2 g l^{-1} under high flow conditions (discharge up to 15 m^3 s^{-1}). Solute load concentra-

tions were generally low around 20 mg l^{-1}. The suspended sediment budget seems to be balanced even though a specific sedimentation pattern could be revealed. During periods of decreasing discharge suspended sediment input rates appear to exceed output rates, whereas increasing discharge causes higher sediment output rates. In contrast to channel processes, slope processes play a minor role from a quantitative point of view. Input through avalanches, rock falls, and debris flows seems to be negligible. It is furthermore remarkable that it is unlikely that at the outlet of the sandur, which represents the sole point where sediment can leave the system, any significant clastic output (bed load) has occurred in 2006. The system therefore appears to be partially closed.